

Specifications for the high peak power C-band 4W fiber amplifier optimized for pulse amplification**1. Introduction**

The Advanced Technology Branch of the U. S. Naval Research Laboratory has a requirement for a high power, C-band, >4 watt average power, fiber amplifier optimized for pulse amplification and appropriate seed source laser. The amplifier must be capable of amplifying a 5 nanosecond laser pulse from a pulsed seed laser (in the wavelength range of 1545 to 1555 nanometers)-to a kilowatt level peak power.

2. The contractor must meet or exceed the amplifier and seed source technical specifications listed below.**a. Amplifier specifications:**

- 1) operating wavelength: $1550 \pm 5\text{nm}$ (in vacuum)
- 2) average optical CW output power: > 4 watts
- 3) manually tunable filter with external monitor tap. The external monitor should be a 1 meter long fiber pigtail with an FC/APC connector.
- 4) output pulse width: $5 \pm 0.5\text{ ns}$ (FWHM)
- 5) external TTL input trigger repetition rate: 200 kHz to 1.5 MHz
- 6) output peak power / energy per pulse
 - at 1.5 MHz: > 0.5 kW / > 2.5 microjoules
 - at 200 kHz: >4 kW / > 20 microjoules
- 7) jitter referenced to input trigger: <1nanosecond
- 8) input connector for seed laser: 1 meter fiber pigtail with FC/APC connector
- 9) output delivery: fiber pigtail $\geq 20\text{cm}$ with collimator
 - recommended collimator: Lightpath Technologies; model # 10275200, 10275300, or 10275400
 - beam diameter: > 1mm
- 10) beam quality: $M^2 < 2$
- 11) longterm output power stability: <5% over 8 hours at 25°C
- 12) interfaces: front panel controls; RS-232, and GPIB
- 13) power supply: 120VAC, 60 Hz
- 14) ambient operating temperature: 15 to 35 C

b. Seed source laser specifications:

- 1) wavelengths: either discrete at 1545, 1547.5, 1550, 1552.5, and 1555 nanometers, or continuously tunable from 1545 to 1555nm
- 2) output pulsewidth: $5 \pm 0.5\text{ nanoseconds}$
- 3) triggering: external TTL level trigger into BNC type connector; trigger repetition rate of 200 kHz to 1.5 MHz
- 4) average output power: > -15dBm
- 5) linewidth: < 0.3 nanometers FWHM
- 6) power supply: +18 VDC
- 7) output connector: FC/APC

3. The contractor must measure the system parameters which are listed below. The contractor shall supply the measurement data to the government.
 - a. Average output power versus wavelength
 - b. Output pulsewidth (FWHM) versus wavelength
 - c. Output pulse energy versus wavelength
 - d. Output power stability
 - e. M^2
4. General specifications
 - a. Amplifier must have an input photodiode for monitoring the seed input power. No output monitor photodiode is required.
 - b. Amplifier and seed source must have the capability of remote computer control and monitoring via an RS-232 port. The amplifier and seed laser delivered must include software which will run in the Windows environment for operation, control, and monitoring of the seed laser and amplifier. The software delivered must display the seed input power monitor and all pump diode currents as well as any alarm or warning conditions.
 - c. Input power requirements must be 115 VAC, 60 Hz or +18 VDC.
 - d. Operating temperature range must be a minimum of +15 degrees C to +35 degrees C.
 - e. Storage temperature range must be at least 0 to +55°C.
 - f. System will operate under non-condensing conditions and must have a minimum warm-up time of < 15 minutes.
 - g. Amplifier and seed laser must be supplied with a heat sink or forced air cooling.
 - h. Amplifier must have an automatic shutdown when the external pulse repetition TTL trigger frequency is less than 200 kilohertz.
 - i. The amplifier must be provided with an appropriate output collimator.
5. Delivery, documentation, and warranty
 - a. Within 30 days of the contract award, the contractor shall provide a Critical Design Review to designated Government representatives at the contractor's facility.
 - b. Within 60 days of the CDR, the contractor shall provide the required changes to the design to designated Government representatives.
 - c. The price of the laser amplifier must include delivery and installation at NRL's Midway Research Center in Stafford, VA. Installation shall include a demonstration of the amplifier system operation and precautions to observe while operating. Installation shall also include a demonstration and measurement of the full system output power with repetition rates of 200 kHz and 1.5 MHz, as well as delivery of the measurement and test data from 3 above.
 - d. The delivery of the amplifier shall take place within 180 days of contract award.
 - e. The contractor shall provide a full set of printed documentation at the time of delivery of the amplifier. This must include one hard copy of all operations and

maintenance manuals, as well as copies of any software and any manuals for the software included with the system.

f. The contractor shall offer the government at least the same warranty terms, including offers of extended warranties, offered to the general public in customary commercial practice. These warranty terms must be included in the system price. The period of the warranty shall begin upon acceptance.